

Application No. 10/553,689
Amendment Dated: August 21, 2007
Reply to Office Action of March 22, 2007

Listing of the Claims:

1. (Currently Amended) A gas phase olefin polymerization process comprising:

(1) preparing a solution of a catalyst precursor comprising a mixture of magnesium and titanium compounds, an electron donor and a solvent;

(2) adding a filler to the solution from step (1) to form a slurry;

(3) spray drying the slurry from step (2) at a temperature of 100 to 140°C to form a spray dried precursor;

(4) slurrying the spray dried precursor from step (3) in mineral oil,

(5) ~~partially or fully pre-activating~~ pre-activating the catalyst precursor by contacting the slurry of step (4) with one or more Lewis Acids employing one or more in-line static mixers, wherein the molar ratio of the Lewis Acid to the electron donor in the catalyst precursor is about 0.1:1 to about 0.75:1; and

(6) transferring the ~~partially or fully activated~~ pre-activated catalyst precursor from step (5) under plug-flow conditions into a gas phase, olefin polymerization reactor and, ~~if the precursor is partially preactivated,~~ adding an additional amount of the activator to the reactor to produce a homogeneous activated catalyst mixture, wherein the catalyst is partially pre-activated in step (5) for about 10 minutes to about 60 minutes prior to the transferring step (6), and wherein the density of a polymer comprising ethylene produced according to the process has a density of 0.930 g/cc or more.

2. (Currently Amended) The [[A]] gas phase olefin polymerization process of Claim 1, wherein the filler comprises a porous catalyst support, comprising:

~~(1) preparing a solution of a catalyst precursor comprising a mixture of magnesium and titanium compounds, an electron donor and a solvent;~~

~~(2) adding a porous catalyst support, to the solution from step (1) to form a slurry;~~

~~(3) drying the slurry from step (2) to form a solid catalyst precursor;~~

~~(4) slurrying the solid precursor from step (3) in a viscous inert liquid;~~

~~(5) partially or fully pre-activating the catalyst precursor by contacting the slurry of step (4) with one or more Lewis Acids employing one or more in-line static mixers, and~~

~~(6) transferring the partially or fully activated precursor from step (5) under plug flow conditions into a gas phase, olefin polymerization reactor and, if the precursor is partially preactivated, adding an activator to the reactor.~~

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3. (Currently Amended) The process of claim 1 ~~or 2~~ wherein;

1) the catalyst precursor in step (1) corresponds to the formula:



wherein R is an aliphatic or aromatic hydrocarbon radical having 1 to 14 carbon atoms or COR' wherein R' is a aliphatic or aromatic hydrocarbon radical having 1 to 14 carbon atoms and each OR group is the same or different;

M is a transition metal;

X is independently chlorine, bromine or iodine;

ED is an electron donor;

d is 0.5 to 56;

e is 0, 1, or 2;

f is 2 to 116;

g is >2 and up to 1.5(d)+3; and

2) the Lewis Acid of step (5) is

i) one or more compounds with formula $\text{M}'(\text{R}'')_n\text{X}_{(3-n)}$ wherein M' is aluminum or boron; each X is independently chlorine, bromine, or iodine; each R'' is independently a saturated aliphatic hydrocarbon radical having 1 to 14 carbon atoms, provided that when M is aluminum, n is 1 to 3 and when M is boron, n is 0 to 1.5; and

ii) is added in an amount such that the mole ratio of total Lewis Acid to electron donor in the precursor is from about 0.1:1 to about 0.3:1 ~~0.10:1 to 1.0:1~~.

4. (Currently Amended) The process of claim 1 ~~or 2~~, wherein said Lewis Acid is;

1) ~~one or more alkylaluminum compound(s) with formula $\text{M}'(\text{R}'')_n\text{X}_{(3-n)}$ wherein M' is aluminum, R'' is n-butyl, n-hexyl, n-octyl, iso-octyl, isohexyl, [[and]] or n-decyl, X is Cl or Br and n is a number from 0 to 1.5; and~~

2) ~~added in an amount such that the mole ratio of total Lewis Acid to electron donor in the precursor is from 0.10:1 to 0.75:1.~~

5. (Currently Amended) The process of claim 4, wherein said Lewis Acid is [;

1)] selected from the group consisting of triethylaluminum, tri-n-butyl aluminum, tri-n-hexyl aluminum, tri-n-octyl aluminum, tri n-decyl aluminum, triisoprenyl aluminum,

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dimethyl aluminum chloride, ethylaluminum dichloride, diethylaluminum chloride, and mixtures thereof, and

2) ~~added in an amount such that the mole ratio of total Lewis Acid to electron donor in the precursor is from 0.10:1 to 0.30:1.~~

6. (Currently Amended) The process of ~~claim 4~~ claim 1, wherein the catalyst precursor slurry is partially or ~~fully~~ preactivated by first contacting with diethylaluminum chloride followed by tri-n-hexyl aluminum.

7. (Currently Amended) The process of claim 1 ~~or 2~~ wherein the viscosity of the slurry after addition of the activator or activators in step (5) is adjusted to at least 1500 cP.

8. (Currently Amended) The process of claim 1 ~~or 2~~ in which the slurry of ~~[(2)]~~ step (4) is intimately mixed with the Lewis Acid in step (5) by use of one or more vertically disposed static mixers.

9. (Currently Amended) The process of claim 1 ~~or 2~~ wherein the one or more static mixers and connecting piping have length/diameter ratios from 5 to 15.

10. (Currently Amended) The process of claim 1 ~~or 2~~ in which said gas phase reactor is the sole olefin polymerization reactor.

11. (Currently Amended) The process of claim 1 ~~or 2~~ wherein two olefin polymerization reactors are employed.

12. (New) The process of claim 1, wherein the catalyst is partially pre-activated in step (5) for about 15 minutes to about 45 minutes prior to the transferring step (6).

13. (New) The process of claim 1, wherein a polymer comprising ethylene produced according to the process of claim 1 has a quantity of fines that is at least 10 percent less than the quantity of fines in a polymer produced under a comparative process under the same conditions except that the comparative process does not include the partial pre-activation of the catalyst precursor according to step (5) of the process of claim 1.